



NASA SBIR 2012 Phase I Solicitation

H12.01 Exploration Countermeasure Capability - Portable Activity Monitoring System

Lead Center: JSC

Participating Center(s): GRC

Human space flight is associated with losses in muscle strength, bone mineral density and aerobic capacity. Crewmembers returning from the International Space Station (ISS) can lose as much as 10-20% of their strength in weight bearing and postural muscles. Likewise, bone mineral density is decreased at a rate of ~1% per month. During future exploration missions such physiologic decrements represent the potential for a significant loss of human performance which could lead to mission failure and/or a threat to crewmember health and safety. NASA is conducting research to enhance and optimize exercise countermeasure hardware and protocols for these missions. In this solicitation, we are seeking portable technologies to collect foot ground reaction force data from current exercise hardware deployed on the International Space Station to be analyzed by research teams on the ground.

NASA seeks a portable, force/load measurement system capable of being integrated into existing ISS exercise systems and suitable for use in future transfer and exploration vehicles. During long duration spaceflight, exercise is prescribed to mitigate bone and muscle loss. Advancement of these exercise prescriptions may require biomechanical analysis of exercise on orbit. Output parameters from the proposed device must be valid in the bandwidth from 0-100Hz and be able to be synchronized with existing analog data systems. 3-D force, torque, acceleration, and turn rates are required. Must include a portable data logging system or wireless interface compatible with the Windows platform or Apple iPad. On-board data processing, activity recognition and display is desirable. The portable system should be low-maintenance, durable, easy to set-up and calibrate, non-disruptive to exercise form or gait, accurate (

NASA Deliverables - Fully developed concept complete with feasibility and top-level drawings as well as computational methodology as applicable. A breadboard or prototype system is highly desired.

HRP IRP Risks - Risk of Impaired Performance Due to Reduced Muscle Mass, Strength, and Endurance; Risk Of Early Onset Osteoporosis Due To Spaceflight

Technology Readiness Levels (TRL) of 6 or higher are sought.

Potential NASA Customers include:

- Human Health Countermeasures Element in Human Research Program:
 - (http://www.nasa.gov/exploration/humanresearch/elements/research_info_element-hhc.html)